CHAPTER 2
PROPOSED ACTION AND ALTERNATIVES

This chapter of the EA presents a detailed description of the proposed action and alternatives to that action. Section 2.1 describes the impulsive PSS array and the proposed PSS ocean test. Section 2.2 discusses alternatives to the ocean test, the ocean test location, and shore station locations, including no action.

2.1 DESCRIPTION OF THE PROPOSED ACTION

2.1.1 PSS Description

2. 1. 1.1 Overview

The Plasma Sound Source (PSS) is an active impulsive sonar source with attributes of ruggedness, low cost, ease of handling, and modest energy level that has the potential to improve the performance of existing and planned passive sonar arrays to enhance detection performance via bistatic or multistatic receiver processing in the littoral environment. The PSS subsystem that would be tested during a scheduled at-sea exercise is shown in Figure 2-1; configurations can vary. It is comprised of a surface buoy or support barge in this instance and a 10m (33ft) long array of 80 equally spaced sparker electrodes.

2.1.1.2 General Background of AST and PSS

The PSS is an embodiment of plasma source (sparker) technology under advanced technology development by the AST project. To the greatest extent possible, PSS hardware and associated components have been and will continue to be tested in laboratories. However, to attain realistic testing conditions, demonstrate its performance enhancing capabilities for existing passive systems, and test the deployment of full-scale hardware, certain tests must be performed in the ocean environment.

As part of the proposed action, a single ocean test occurring between mid-August and 30 September 1999 would be conducted to evaluate the performance of the prototype PSS. The AST project proposes to conduct these tests at a location within the shallow water ocean environment. These tests are proposed to demonstrate and validate operational realism and utility of all components of the PSS subsystem working as a whole. By implementing these tests in the marine environment, more realistic conditions can be achieved.

2.1.2 PSS Ocean Test Description

The AST project is proposing to conduct a PSS ocean demonstration test. This proposed underwater ocean test would utilize the hardware and components previously. The purpose of the test would be to evaluate the performance of the PSS subsystem and its ability to enhance the performance of current passive MIUW receivers in an active bistatic mode.

2.1.2.1 PSS Ocean Test Activities

PSS ocean test activities would require a maximum of 10 shipboard personnel for installation, operation, and retrieval of the system. The proposed test would actually occur during a 22-day period within the six-week test window. Once the system has been deployed, the maximum number of days of

operation for the test would be approximately eight days; however, testing would not occur continually. PSS ocean test activities would incorporate active acoustic testing. Artificial broadband energy acoustic emissions between 300 and 650Hz active impulsive acoustic transmissions would be introduced into the ocean environment to enable testing the system over its full range. A maximum of 56 hours of active acoustic testing, occurring only during daylight hours, is proposed over the eight day period. During active acoustic testing of the system, the PSS array would be deployed from a test barge. Data processing would take place on the barge in a processing enclosure. Table 2-1 provides a summary of the proposed PSS ocean test.

Activities associated with the proposed ocean test would primarily include the following deployment of the system, inspection and operation of the system, and retrieval of the system.

Table 2-1. Summary of PSS Ocean Test

Key Test Parameters	Test
TEST CHARACTERISTICS	
Maximum Test Period (Active Transmission)	8 days
Number of Test Vessels	2
Total Length of Cable	<3 km
Wet-end Inspection and Repair*	Yes
Component Retrieval	Yes
ACOUSTIC PARAMETERS	
Maximum Active Acoustic Testing (daylight only)	56 hours
Plasma Sound Source	
Source Level	219 dB re 1 μPa^2-sec
Frequency Range	300 –650 Hz
Signal Duration	2.5 ms
Range of Time between Pulses	15 seconds to days

* Wet-end inspection and repair would occur only as required.

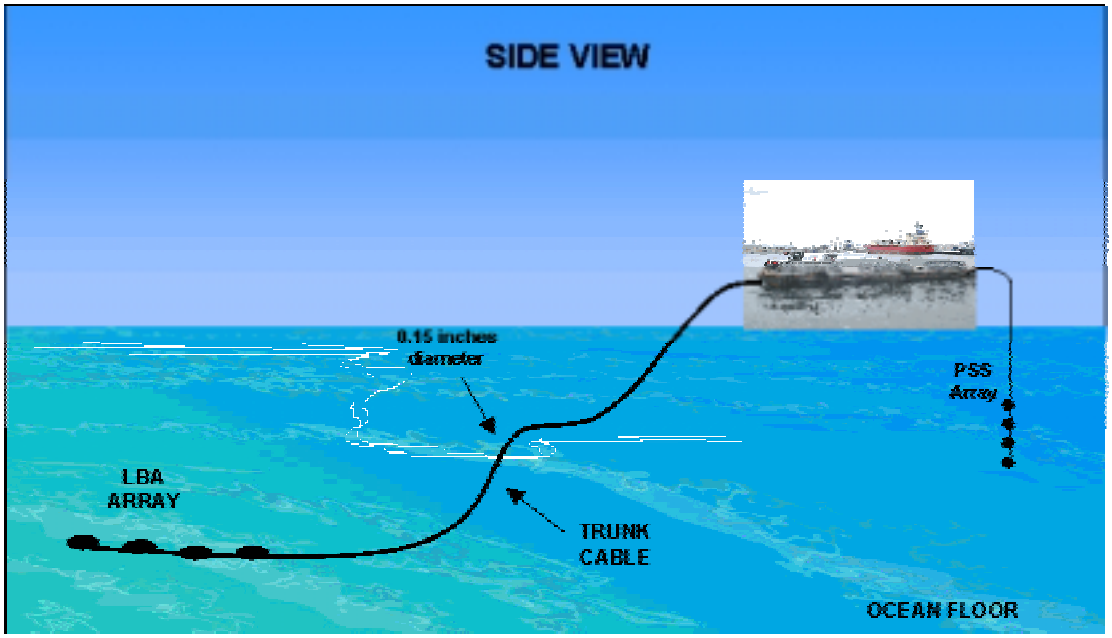
Deployment of the System

Deployment procedures would consist of mooring the support barge in about 91 m (300 ft) of water and unreeling the PSS array to a depth of about 80 m. A passive R&D array (Lightweight Array Subsystem prototype or LBA array) would be deployed approximately one-half nautical mile from the barge. Typical deployment for PSS is illustrated in Figure 2-2.

Operation of the System

Active acoustics would be used during the PSS subsystem's proposed testing. Operation of the system would consist of the PSS sound source emitting impulsive sounds.

Test Vessels. Three surface test vessels would be used as part of the proposed activities; the test barge and two support vessels for supply and personnel transfer. The test vessels would have deck lights, designed to support personnel safety, which would provide visibility from between 46-91 m (150-300 ft), at night. No night operation of the active PSS is planned.



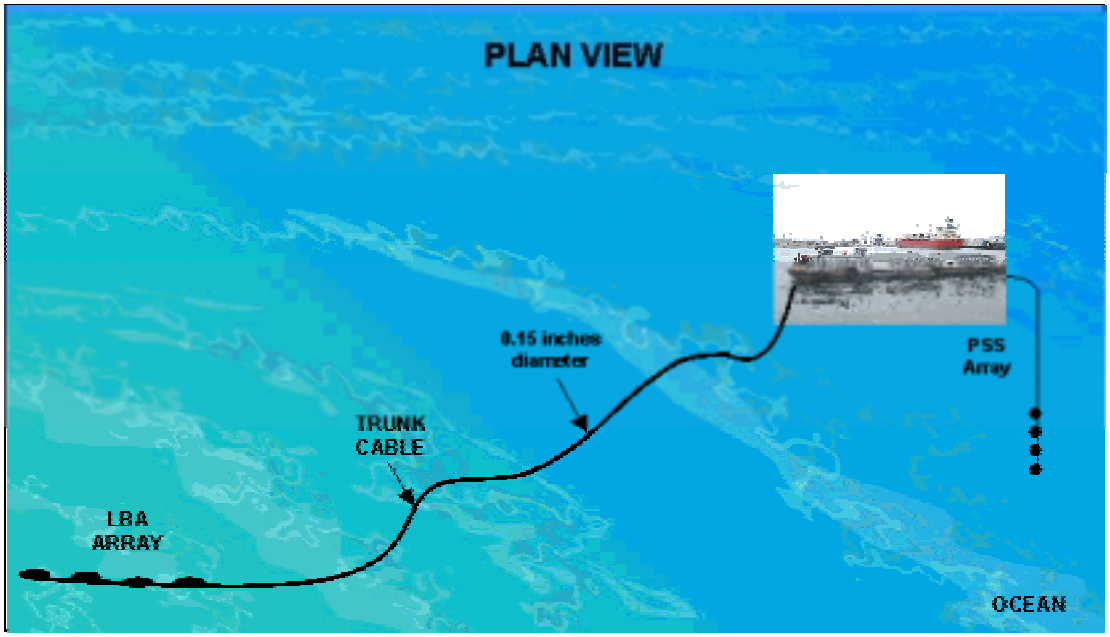


Figure 2-1. System Concept

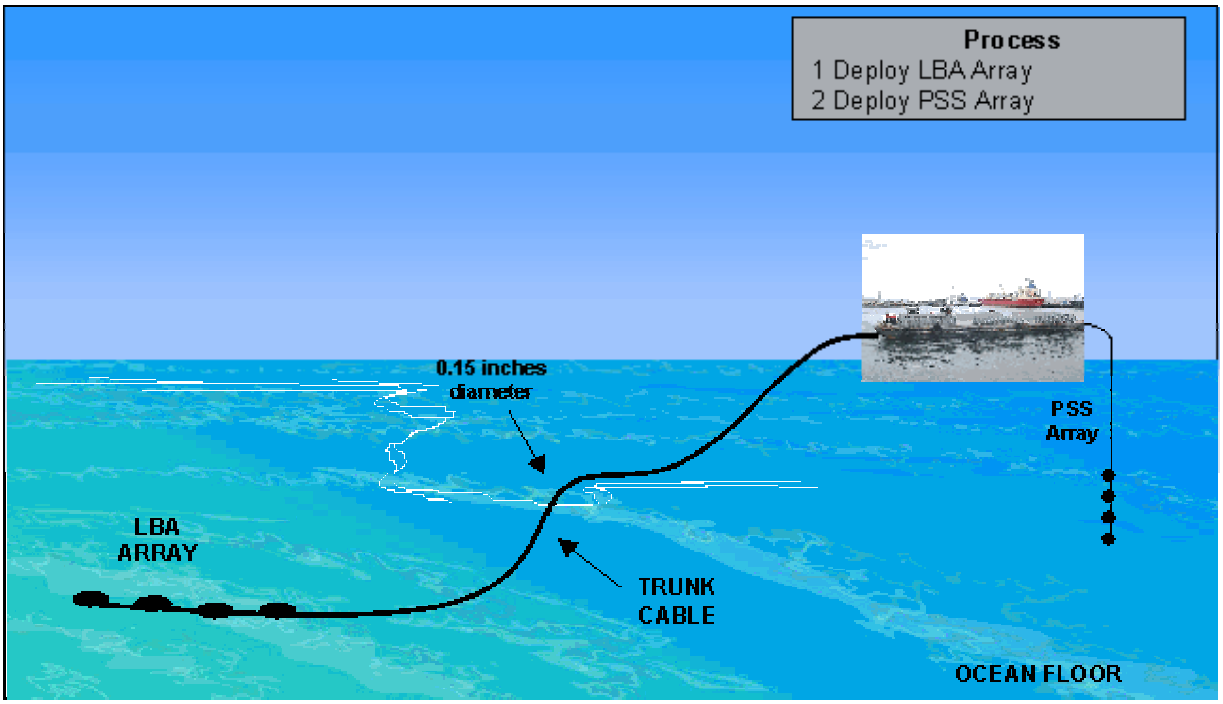


Figure 2-2. Typical Deployment for Ocean Test

Plasma Sound Source. The acoustic signature of the PSS is shown graphically in Figure 2-3. A single shock pulse characterizes the underwater pressure signature for this event. The pressure rise represents the shock wave, followed by a drop in pressure (negative phase), followed by a series of pulses of progressively reduced pressure. In the case of a single electrode, 2.5 milliseconds (ms) represents the time interval between positive peaks in the waveform. The energy spectrum would peak broadly at about 450 Hz, consistent with the measured 2.5 ms interval between positive peaks. The bandwidth would be approximately 300 - 650 Hz, which includes energy densities within about 7 dB of the peak. When multiple electrodes are configured into an array, the second pulse peaks do not coherently sum and a single peak of approximately 25 μsec duration results. In this case, the energy source level would be 219 dB re 1 μPa^2-sec. The peak pressure in reflected ray paths would not arrive coincidentally with the direct path, preventing any coherent addition. For the PSS ocean testing, there would be a minimum of 15 seconds between each transmission. Therefore, each transmission would be considered an independent acoustic event, given the instantaneous nature of the generated pulse. It is worthwhile to note that the energy released in a single array transmission event is equivalent to the energy released by less than one third of an ounce (0.021 pounds) of TNT distributed evenly across a 10m length of explosive.

2.2 ALTERNATIVE ANALYSIS

The types of alternatives considered in this EA include alternatives that meet the testing needs, alternative ocean test sites that meet testing objectives, and no action.

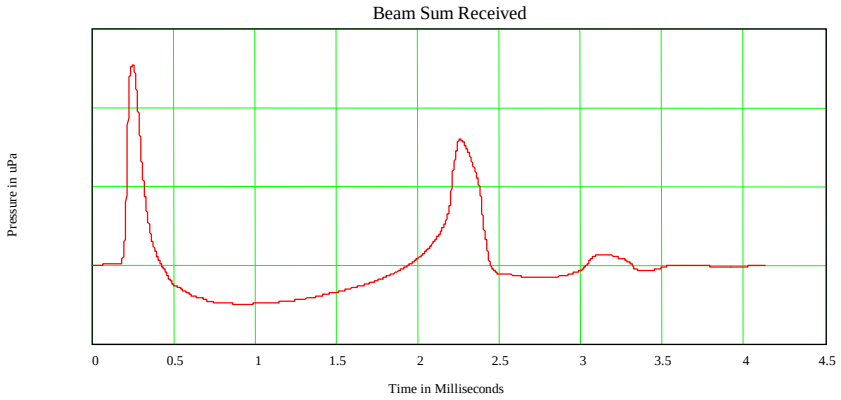


Figure 2-3. PSS Acoustic Signature

2.2.1 Alternatives to the PSS Ocean Test

The only alternative to acquiring data through the proposed PSS ocean test is to obtain the needed information through laboratory testing. However, this alternative does not meet the objectives of the tests since real-world conditions and receivers are necessary to validate the PSS capabilities. Several test and performance parameters in the PSS design cannot be simulated in the laboratory. In addition, it is impossible to demonstrate PSS's potential U.S. Navy Fleet use in a laboratory. Since laboratory testing does not meet the purpose and need of the PSS system development testing, this alternative is not carried forward for analysis in this EA.

2.2.1.1 PSS Ocean test Operational Criteria and Siting Process

Systematic operational criteria were analyzed to determine reasonable site locations for conducting the ocean test that would meet the purpose and need of PSS. The siting process involved the development of specific operational siting criteria based on test objectives, which included the following:

- operational realism (adequate deployment area/depth/performance measurability);
- survivability (weather conditions/level of fishing/terrain);
- scheduling (low potential for schedule change);
- availability (test site is available for conduct of tests);
- accessibility (physically and economically feasible to reach test site);
- supportability (necessary amenities); and
- availability of opportunistic targets (critical due to the limited funding available to this Research & Development (R&D) effort).

Once these operational siting criteria were identified, various regions were considered in a tiered analysis to evaluate potential locations for conducting PSS ocean test. Operational siting criteria were first used to eliminate general areas from further consideration and to compare the advantages and disadvantages of potential site alternatives. Sites considered included the following:

- sites within U.S. territorial seas;
- foreign sites.

Initially, foreign sites were considered; however, foreign sites could not provide the requisite facilities, assets required, detailed environmental information, and stable conditions appropriate for this level of R&D system testing. Due to the high potential for schedule changes, equipment damage associated with weather, uncertain political atmosphere, cost impact, and unknown environmental variables, foreign sites were deemed unreasonable for implementation of the PSS system. Since effective testing requires relatively stable conditions, foreign sites were not carried forward for further analysis in this EA.

In the next tier of analysis, U.S. territorial seas were identified as the only viable siting option; however, coastal waters off Alaska were eliminated due to extreme weather conditions. The East Coast, Hawaii, and the Gulf Region did not meet all of the operational siting criteria and therefore were not carried forward for further analysis in this EA. Based on the tiered analysis and the identified costs savings resulting from the opportunistic use of available assets, the West Coast was identified as the only area that met all operational criteria for implementation of the PSS ocean test (Table 2-2).

Table 2-2. Proposed PSS Ocean Test Operational Criteria

Criteria	Alternative Locations			
	West Coast	**East Coast**	**Hawaii**	**Gulf Region**
Operational Realism/ Performance Measurability	Adequate laydown area and operational depth	Too shallow to meet performance criteria	Nearshore too deep to meet performance criteria	Adequate laydown area and operational depth
Survivability	Predictable weather conditions, moderate fishing threat	Subject to severe weather, heavy fishing, and rugged coastline-more than moderate risk	Predictable weather conditions, moderate fishing threat	Subject to severe weather, heavy fishing-more than moderate risk
Scheduling	Low potential for schedule change	Potential schedule chances due to weather	Potential schedule changes	Potential schedule chances due to weather
Availability	Location physically accessible to Fleet and MIUW LBA array assets	Location physically accessible to Fleet	Accessible to Fleet, but long transit time of the test assets	Accessible to Fleet, but long transit time of the test assets
Supportability	All necessary amenities available on site	All necessary amenities available on site	All necessary amenities available on site	All necessary amenities available on site

Once the West Coast of CONUS was identified as the most reasonable area within which to conduct the PSS ocean test, specific site locations that could meet the objectives were evaluated based on the more detailed operational and environmental siting criteria presented below. These criteria were first used to determine the characteristics of proposed test locations and whether these locations could meet specific test objectives:

- adequate cable laydown area and operational depth;
- ambient acoustics;
- shipping traffic;

- availability of the required targets of interest
- weather conditions; and
- proximity to Navy assets (see ES comments).

Using the more detailed siting criteria, three candidate PSS ocean test sites along the West Coast of CONUS were identified: northern site (Puget Sound), Pacific Northwest, and southern California. Only the southern California sites satisfied all required operational criteria (Table 2-3).

Table 2-3. Comparison of West Coast Ocean Test Sites/Operational Criteria

Operational Criteria	Northern Site (Puget Sound)	Pacific Northwest Site	Southern California Site
Laydown Area	Inadequate	Adequate	Adequate
Operational Depth	Medium variability	High variability	High variability
Ambient Acoustics	Represents operational environment	Represents operational environment	Represents operational environment
Shipping Traffic	Heavy	Medium to light	Medium
Moderate Fishing Threat	Heavy fishing	Medium to heavy fishing	Medium fishing
Proximity to Navy Assets Required for Sea Test	Inadequate	Inadequate	Adequate
Cost to Obtain Navy Assets Not Available Locally for Sea Test	High	High	Nominal

2.2.2 PSS Ocean Test Locations

2.2.2.1 Proposed Location

The area proposed for conducting the PSS ocean test would be located within the marine environment of southern California, between the northern and southern boundaries of MCB Camp Pendleton, outside of 3 nautical miles from land and more than 35 nautical miles south-southeast of Santa Catalina Island. The specific mooring location of the system is shown in Figure 2-4.

Exclusion Areas

To avoid potential environmental and operational conflicts, laydown and operation of the PSS system would not occur within exclusion areas discussed below.

Sea Banks. Areas containing sea banks were identified as exclusion areas due to commercial fishing resources, cultural resources, and potential operational constraints associated with the laydown of the system.

Known Dump Sites. Exclusion areas were established around known dump sites due to potential operational constraints associated with the lay down of the passive MIUW array.

Known Diver Sites. To eliminate potential risk of acoustic exposure to scuba divers, no sound energy source levels greater than 175 dB would occur in waters less than 61m (200 ft) in depth. In addition, the Navy would ensure that no divers or dive flags were operating in the vicinity of the test vessel.

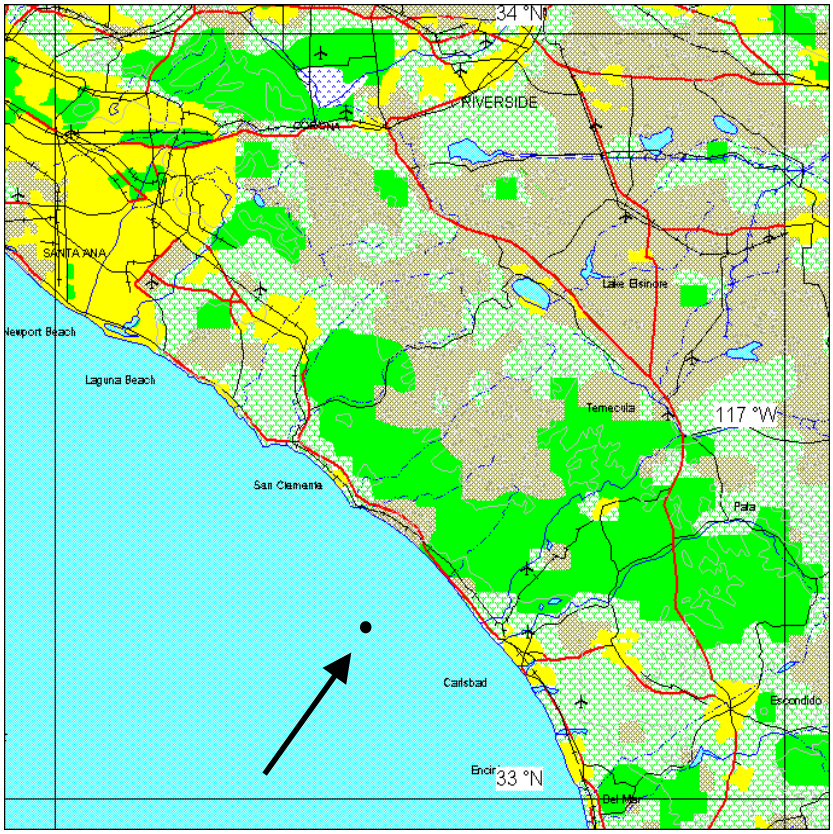


Figure 2-4. Approximate Location of Proposed PSS Ocean Test

2.2.3 No-Action Alternative

Under this alternative, the proposed action would not be implemented at this time. The result of not conducting these tests would impact the DoN's ability to meet mission objectives. PSS demonstration and development cycle would be substantially delayed because design verification/validation testing would not occur. The No-Action Alternative is carried forward for analysis in this EA for comparison of impacts.